A critical appraisal of "The effects of aerobic, resistance, and combined exercise on metabolic control, inflammatory markers, adipocytokines, and muscle insulin signaling in patients with Type 2 Diabetes Mellitus"

By

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Abstract

The aim of this critical appraisal is to analyze the reliability and validity of the chosen research article. Being able to critically appraise a research article is a highly valuable skill that health care providers should be very fluid in before they practice any intervention. I chose this specific article to critically appraise because it closely relates to my clinical question. My clinical question compares different types of exercises regimes on individuals with Type 2 Diabetes Mellitus to see which has a more beneficial effect on different diabetic markers and overall quality of life. I critiqued the introduction, methods, results, and discussion by examining the article's limitations, weaknesses, and strengths. The introduction and methods section were very well written as they included background information and enough detail that the experiment could be replicated. The results section adequately addresses the hypothesis that was asked in the introduction and included informative charts. Lastly, the discussion section failed to explain the clinical importance of the results. Overall, the article was well written, and I believe there are important clinical implications based on this article. Critically appraising is a skill that I will continue to develop as I am a lifelong learner of the physical therapy profession and want to provide quality care to my future patients.

Key words: diabetes mellitus, aerobic, resistance, appraisal

Introduction

The purpose of this critical appraisal is to examine the reliability, validity, and relevance of the research article, "The effects of aerobic, resistance, and combined exercise carefully and systemically *on metabolic control, inflammatory markers, adipocytokines, and muscle insulin signaling in patients with Type 2 Diabetes Mellitus".* It is important to critically appraise research articles to ensure their credibility. Before implementing any intervention on a patient, it is important to know its potential benefits, potential risks, and the scientific reasoning behind it. It is vital that physical therapists and other health care providers stay up to date on research and critically appraise them before implementing the interventions. This critical appraisal aims to appraise this research article and how well it can be used to answer the clinical question, "In patients with Type 2 Diabetes, is aerobic exercise or resistance training more effective in reducing blood glucose levels and improving overall body functions?"

Methods

The database I used was PubMed. The key words I used to conduct my search were aerobic exercise, resistance training, and Type 2 Diabetes. The limits I placed on my search were free full text article, Randomized Controlled Trial and Clinical Trial, and a Publication Date of 10 years. I applied these limits to ensure that I would have access to the full article and that the article would be appropriate for this specific assignment. I also put a limit on the publication date because I wanted the articles to be as up to date with current research as possible. Articles were excluded if they dealt with a population that had Type 1 diabetes and not Type 2 diabetes. They were also excluded if it was a review of another research study. I also ensured that each article contained the interventions of aerobic exercise and resistant training. These inclusions/exclusions were included to ensure the articles met the criteria and that they were relevant to my clinical

question. My specific search results displayed 120 total hits, and then I began to review the articles.

This research study was conducted in Brazil by associates from Federal University of Uberlandia and State University of Campinas in 2010. The research article was accepted into the Journal of Metabolism Clinical and Experimental in 2011. The authors that conducted this study are from a variety of medical science backgrounds such as endocrinology, genetics, biochemistry, and molecular biology. I chose this specific article for critical appraisal because it most closely answered my clinical question. It focuses on the specific interventions I am concerned about in reducing blood glucose levels and improving overall body functions in patients with Type 2 Diabetes.

Results

Summary of the study

The purpose of this study was to compare the effects of aerobic, resistance, and combined exercise on metabolic control, inflammatory markers, adipocytokines, and muscle insulin signaling in patients with Type 2 Diabetes Mellitus. Forty-eight individuals with Type 2 Diabetes Mellitus were randomly assigned to four different exercise groups. The groups were a control group, aerobic group, resistance group, and a combined group of aerobic and resistance training. Each group consisted of twelve individuals, (n = 12). Each group participated in the specified exercise for three times a week for sixty minutes each session for a total of twelve weeks. At the beginning of the twelve-week period, baseline measures of fasting and postprandial blood glucose, glycated hemoglobin, lipid profile, insulin resistance index, adipocytokines, tumor necrosis factor, interleukin, IRS-1expression, and high-sensitivity C-reactive protein were taken. Decreases in blood pressure, fasting plasma glucose, postprandial plasma glucose, lipid profile,

and hs-CRP were seen in all four groups. No significant difference was seen in these decreases across the four different groups. The study concluded that exercise has many positive effects on glycemic parameters, lipid profile, blood pressure, and hs-CRP with no significant difference between the different types of exercise. Additionally, resistance training and a combination of resistance training and aerobic exercise can increase IRS-1 expression in muscles. Some participants were even able to reduce dosages of insulin and hypertensive medications as a result of the exercise regime.

Appraisal of the study introduction

I found the introduction to be very informative. It gives a thorough background on the effects of exercise and diet in patients with Type 2 DM. It also gives background information on other studies that have researched similar topics. The introduction was comprehensive and informative enough that I did not feel the need to seek out further information. Overall, the introduction was clear and well written. It included other relevant literature and clearly stated the purpose of the study. The purpose of this study was to determine the effects of different exercise regimes on metabolic control, insulin resistance, inflammatory markers, adipocytokines, and tissue expression of intermediates of the insulin signaling pathway.

The authors include information from sources that were over 10 years old at the time that the research article was published. Therefore, the information from these sources may not be as up to date and have the possibility of affecting the credibility of the research study. A few sources were also in a foreign language and required the use of Google Translate to ensure they were legitimate sources.

Appraisal of the study methods

All groups were managed the same way except for the experimental interventions. Each participant underwent a clinical evaluation to determine if there were any chronic complications or disorders that could possibly lead to contraindications. At the beginning of each session each participant's blood glucose, resting blood pressure, and heart rate was recorded.

The intervention is described clearly and in enough detail that it could be replicated. The article goes into detail of what each exercise group did and the specific muscle groups that were trained.

A limitation of the methods section was that the repetitions and number of sets that the resistance group performed were not stated. The study did not specify if it was blinded or double blinded. Each of the subject's group assignment was not concealed from the people enrolling individuals in the study nor were subjects masked or blinded to their group assignment. Clinicians and outcome assessors were not masked or blinded either. The lack of concealment and blindness leaves a possibility of bias to occur.

Appraisal of the study results

The results section was well written in an organized and clear manner. The results were presented in the same order that the research questions were presented, which made the results easy to read. All the tables were presented clearly and accurately. The researchers also included a legend to explain what the abbreviations were that were used in the charts. The charts and graphs made sense and no errors were found. The threshold p value was 0.05 and a 95% confidence interval was used. The only statistically significant results were IRS-1 expression and VO2 MAX. There were decreases in other parameters that were measured like blood pressure and glucose levels, however there was no difference between the different exercise groups.

The authors of the article included two tables in the results section. The tables were informative; however, they included a great deal of information and numbers. The tables were very busy and hard to read. This made understanding and interpreting the results difficult.

Appraisal of the study discussion

The authors related the findings with other existing literature. Many of their findings were consistent with existing literature. The authors included credible and reliable sources in their discussion of the results. However, the increase seen in IRS-1 expression conflicted with previous findings.

The authors just repeated the results in the discussions section. They did not go into detail about why the findings were or were not significant. The study did mention and recognize its limitations. A limitation in this study was the small sample size. The small sample size that was used may have limited the researcher's ability to see significant differences between the different exercise groups.

Discussion

This study is clinically significant to current physical therapy practice because as a Physical Therapist who plans on working with the diabetic population specifically, I wanted to research what type of exercise is most effective in reducing different diabetic markers. There are many comorbidities and medical complications associated with Type 2 Diabetes Mellitus. Because of this, patients with Type 2 Diabetes Mellitus are often put on a very extensive medication regime. However, if more patients with Type 2 Diabetes Mellitus went to physical therapy and were educated on types of exercise routines that they can later do at home, their overall quality of life would vastly improve as would their different bodily functions. This study is relevant to my clinical question because it addresses the specific interventions asked in my question.

Potential benefits of using the article's intervention in the clinic are that aerobic exercise and resistance training in general have many positive and beneficial effects on individuals with Type 2 Diabetes

Mellitus. The study also indicated that many of the participants were able to reduce the dosages of their medications. A potential risk is that not every patient will be able to perform aerobic or resistance training, especially if they live a sedentary lifestyle. They may also experience soreness and this could possibly discourage them from continuing therapy. However, the benefits of aerobic and resistance training on diabetic markers greatly outweigh the risks. It is imperative that the physical therapist educate and ease the patient into the exercise regime. The fact that there were not many significant differences between the different groups in the study could reduce the argument for using this intervention.

I do have confidence to use this evidence with my future patients because the study did find that aerobic, resistance, and combined exercise have a positive effect on patients with Type 2 Diabetes Mellitus. I believe I could implement these interventions safely in a clinical setting by monitoring the patient's blood glucose levels and oxygen levels during the therapy session.

In conclusion, the article provides clinically meaningful information that a physical therapist can use when working with patients who have Type 2 Diabetes Mellitus. As a future physical therapist, I will continue to critically appraise articles to ensure I am providing quality and evidence-based care to my patients.